LINCOLN
APPLIED GEOLOGY, INC.

September 1, 1989

Mr. Michael Silver
P.O. Box 539
North Bennington, VT. 05257

Re: Summary Letter Report regarding the
Fuel Oil Contamination Problem at the
Silver Residence, No. Bennington, VT.

Dear Michael:

This letter report is written to summarize the findings of the subsurface contaminant investigation that Lincoln Applied Geology, Inc. (LAG) has performed at your home (shown on Figure 1) during July and August 1989. This work follows three months of investigation and clean-up work performed at your residence by New England Marine Contractors, Inc. (NEMC). A brief summary of the work performed by NEMC prior to LAG's involvement is presented below.

In early April 1989, fuel oil was discovered seeping up through the cement floor in the basement of your home. In response to this problem, NEMC was contracted (on your behalf) to determine the source of the fuel and to clean up the fuel oil saturated material in the basement. NEMC hypothesized that the copper delivery line connecting the 275 gallon fuel oil storage tank to the oil fired furnace had catastrophically failed. The location of all fuel oil related facilities are shown on the detailed site map shown as Figure 2. A subsurface contaminant investigation was initiated by NEMC which consisted of placing several soil borings around the house and installing one 2-inch monitoring well on the north edge of the property. The soils from each of the borings were screened with a photoionization device for evidence of petroleum vapors. None of the soil encountered in the monitoring well or borings contained detectable levels of petroleum vapors (i.e. fuel oil vapors). In an attempt to delineate the extent of contamination beneath the basement floor, NEMC excavated an observation trench to a depth of one foot through the floor. The trench, shown on Figure 2, was placed parallel to the delivery line and along the east and south sides of the chimney. Several areas within the trench were excavated to a depth of three feet in an attempt to create sumps which would allow free fuel oil product to be collected. The ground water which flowed into each of these holes was highly contaminated with fuel oil. The hole on the east side of the chimney contained approximately 1/2" of free phase fuel oil product floating on the ground water. Because of the presence of free product, NEMC installed a ground water depression and treatment system to remediate the contamination problem. NEMC's June 5, 1989 summary letter regarding the work they performed on your property is presented as Attachment A of this letter report. Based on our requests for all

information and correspondence generated by NEMC, and our receipt of only the June 5, 1989 letter it is apparent to us that no other information was compiled or generated by NEMC regarding the contamination problem at your residence.

In response to your (and your insurance companie's) feelings that the investigation and clean-up were not proceeding in an acceptable manner, you contracted LAG on June 30, 1989 to further investigate and remediate the fuel oil contamination problem beneath your basement floor. This work was initiated on June 30, 1989 and has continued to date.

Your residence (i.e. the Silver residence) is located on Hall Street in the town of North Bennington, Vermont in the west-central portion of Bennington County. The general location of the site is shown on Figure 1. The residence is situated on a plot of land which has been filled in to a point approximately 8 feet above native grade. The elevation of the site is approximately 650 feet above mean sea level. The property is bounded by an embankment to the north, residences to the east and west, and Hall Street to the south. All residences in the area are serviced by both public water and sanitary sewer systems which are unaffected by the fuel oil leak. The site is topographically described as flat from Hall Street to the top of the embankment. At this point the land surface drops steeply (approximately 8 feet) to the existing natural surface grade. Precipitation falling on the site will either directly infiltrate the soils and directly recharge the ground water system, or flow towards the north as surface run-off. A detailed site location map showing the property, building locations, and the Silver basement area is enclosed as Figure 2.

Although your overall residence has been affected by fuel oil vapors, the basement is the only part of the building that has been affected by free phase fuel oil product. In order to effectively remediate the problem (i.e. remove the free product which is the source of the vapors) the physical make-up of the basement must be known. In this regard, the basement of your residence is constructed of a poured concrete floor approximately 3 to 6-inches thick. The walls of the basement are made of concrete poured in a series of 6-inch lifts. A cinder block chimney measuring approximately 4 feet by 6 feet is located in the center of the building. The basement is divided roughly in half by a north-south running wall. The western half of the basement is used as a family room. The eastern half is used as a utility/storage area.

The objectives of the investigation/remediation were to:

1. immediately eliminate the fuel oil vapor problem within your residence,

2. immediately design and install a ground water containment/ product recovery system to eliminate potential off-site migration of contaminated ground water and free phase fuel oil,

3. define the exact point of fuel oil leakage from the copper delivery line,

4. define the subsurface hydrogeology of the site,

5. define the physical extent and magnitude of fuel oil contamination within the ground water and the soil, and

6. define the chemical air quality within the residence to determine when it can be safely inhabited.

The immediate reduction of petroleum vapor entering the residence was achieved by:

1. sealing the exposed observation trench with polyethylene plastic,

2. constructing a polyethylene plastic lined containment area which isolated the portion of the basement area directly affected by fuel oil vapors from the rest of the residence, and

3. installing and operating a high volume, activated carbon air cleaner within the vapor containment area.

The eastern half of the basement was found to be contributing the majority of the fuel oil vapors affecting the over-all residence. In response, this section of the basement was isolated utilizing polyethylene plastic as a containment mechanism. The plastic was attached to the walls and ceiling with staples and duct tape. Once the highly contaminated area of the basement was isolated, a high volume activated carbon air cleaner was installed to filter the air contained within the area. This reduced the amount of vapors which could potentially escape into the living area of the residence. In early July 1989, ambient HNU photoionization device readings in the basement ranged between 5 and 10 ppm. Currently, ambient HNU readings within the containment area range between 1 and 2 ppm which indicate that the vapor mitigation efforts have been successful. The family area of the basement, which is not enclosed in the plastic containment, currently gives ambient HNU readings ranging from 0 to 0.5 ppm.

Positive HNU readings ranging between 0.5 and 1.2 ppm (along with significant olfactory evidence of fuel oil vapors) were monitored in the living area of the residence before the vapor containment and the air filtration system were installed . Because of these indicators of significant fuel oil vapor contamination, LAG recommended that the residents

of the house be evacuated until the air quality within the building could be accurately determined as safe. This determination is actively in process and will ultimately be made by LAG with the assistance of the Vermont Department of Health (VDOH). On the brighter side, ambient HNU photoionization readings within the living area of the residence have not been above background since the installation of the polyethylene containment area in the basement.

With regard to the design and installation of a ground water containment/product recovery system, NEMC originally installed a ground water depression pump in an existing sump hole located in the northeast corner of the basement (see Figure 2). As of early July, the depression activities had yielded little to no recoverable free product. For this reason, LAG determined that a more effective location for the ground water depression/product recovery system was needed. The adaptation and installation of the new recovery system has included:

1. moving the location of the ground water depression system to a point adjacent to the chimney,

2. installation of an additional trench running from the new recovery well to the north wall along a crack in the basement floor,

3. further excavation of the existing observation trenches to a depth where the native soil layer was encountered,

4. adaptation of the ground water depression system to enable both ground water and free product to be pumped into an oil/water separator located adjacent to your driveway, and

5. installation of carbon filtration units to treat the highly contaminated ground water exiting the oil/water separator before it is discharged to the surface.

Upon investigating the observation trenches installed by NEMC, LAG observed that the majority of free phase fuel oil contamination existed near the east edge of the chimney. LAG removed the ground water depression system from the existing sump and re-installed it adjacent to the east edge of the chimney (shown as RW-1 on Figure 2). It was also noted that a substantial amount of free phase fuel oil had entered the basement from a crack in the cement which runs from the chimney area to the north wall. In order to investigate this area further, an observation trench was excavated along the crack. Substantial amounts of vapor and free phase fuel oil were found in the soils associated with the new trench.

Based upon the appearance of the soils within the observation trenches, it became apparent to LAG that fuel oil contamination most probably existed beneath the majority of the basement area. In an attempt to directly impact the most severely affected areas of the basement, the observation trenches were excavated to a depth where native soils were encountered. The soils encountered during the excavation of the observation trenches consisted of approximately 1.5 feet of stony, silty fill. The fill soils thickened to 2.5 to 3 feet in the areas of the chimney and the footing of the north wall. The fill soils near the chimney contained large amounts of free phase fuel oil. The soils associated with the far ends of the original trench contained fuel oil vapors only. The fill soils associated with the new trench contained free phase fuel oil adjacent to the chimney and the north wall footer. The native soils below the fill resemble a lake bottom or wetland clay that naturally confines the fuel oil to the basement yet has been unaffected by the spill. The native clay representing a natural barrier was sloped from the far ends of the trenches towards the recovery well and filled with approximately 1 to 2 feet of 1" diameter crushed stone. The placement of the stone created preferred high permeability paths for the ground water and fuel oil to flow beneath the basement floor. The stone filled trenches (now referred to as flow enhancement trenches) were sealed with polyethylene plastic to reduce vapors. As the flow enhancement trenches were excavated, the contaminated soil was removed from the basement and stockpiled on and covered by plastic adjacent to the residence. The location of the contaminated soils and the finished flow enhancement trenches are located and shown on Figure 2.

The definition of the exact point of fuel oil leakage from the delivery line connecting the 275 gallon fuel oil storage tank to the furnace was determined by gently chipping the cement flooring away from the line and examining it. At a point approximately 10 feet from the furnace, a 3 foot long section of the delivery line was found to be both severely pitted and perforated by several large holes (see Figure 2). The remainder of the delivery line appeared to be in fair to good condition with no obvious evidence of leakage. The delivery line was not wrapped with any protected coating or material which would prevent pits and/or perforations from forming. Because of this, it appears to LAG that the lime in the cement reacted with the copper line thus creating the large holes from which the fuel oil leaked.

The hydrogeology of the site, and the physical extent and magnitude of fuel oil contamination beneath the basement floor were determined by:

1. installing eight 4-inch diameter PVC hand augered monitoring wells,

2. installing seventeen, 1-inch PVC vapor monitoring points,

3. performing a site survey to locate and determine the relative elevations of the auger wells, vapor points, and the top of the native clay surface,

4. collecting ground water elevation, product thickness, and vapor concentration data,

5. generating ground water contour maps,

6. generating HNU photoionization data isopleth maps, and

7. compiling and analyzing of all data collected.

Five hand augered monitoring wells were installed through the basement's concrete floor. These wells are labeled AW-1, AW-2, AW-3, AW-5, and AW-6 and are shown on Figure 2. Each of these wells was augered to a point at least 1 foot into the native clay layer. A 4-inch diameter filter fabric wrapped, axially slotted monitoring well was installed in each auger hole. Each of the wells was sealed at the floor surface with a water tight cement to prevent vertical movement of contaminated ground water, vapor, and free phase fuel oil into the basement living space. Three additional 4-inch monitoring points were installed in the flow enhancement trenches. Each of the wells, labeled AW-4, AW-7, and AW-8, were placed in the trenches at a point farthest away from the recovery well. These wells are also shown on Figure 2.

Seventeen 1-inch diameter vapor monitoring points were also installed. The points are constructed of a 1-inch diameter PVC tube inserted through the cement to a point between 1/4 and 1/2 inch below the bottom of the concrete floor. Each of these points was sealed at the floor surface with a water tight cement.

A site survey was performed to relate the elevations and locations of the auger wells, vapor points, the outside monitoring well, and the site boundaries. This data was used to generate the detailed site map shown as Figure 2. The survey data was also used in conjunction with the soil profile data gathered during auger well and flow enhancement trench construction to determine the slope of the native clay surface. This information was generated to enable the location of low spots or pockets in the clay surface that might be accumulating significant amounts of free phase fuel oil. The data indicates that the clay surface is essentially flat. The only true low spots or pockets in the clay surface were found where they had been excavated to accommodate the chimney and basement wall footings.

Ground water elevation and product thickness data has been collected by LAG on a weekly basis and is presented as Table 1. This data has been utilized to generate ground water contour maps which show ground water flow

directions and flow gradients. The contour maps for data collected on July 11, July 28, and August 18, 1989 are enclosed as Figures 3 through 5 respectively. As can be seen on each of these figures, a substantial cone of depression exists in the ground water system beneath the basement floor. This cone of depression has been created by the ground water depression activities occurring in the recovery well. Normally, the ground water flow direction through the site is from south to north at a relatively steep gradient of approximately 0.042 feet per foot. Figures 3 through 5 vividly show that ground water within the basement area slopes towards the recovery well. The water and product monitoring data presented as Table 1 shows that product thickness in the basement area has decreased to a point where no free phase fuel oil is evident. The ground water elevation/product thickness data presented on Table 1 is also enclosed in graphical form as Figures 6a through 6j. Each of these graphs show how ground water elevations across the site have been steadily increasing, while product thicknesses have been steadily decreasing.

Weekly HNU data collected from the vapor points is presented as Table 2. Vapor levels have fluctuated considerably throughout the investigation period. Figures 7a through 7c represent the HNU isopleth (concentration contour) maps for July 11, July 18, and August 28, 1989. Figure 7a shows the HNU data for July 11, 1989. At this time the majority of vapor was associated with the east-west running flow enhancement trench and the recovery well. Figure 7b shows how the area of vapor contamination has increased drastically in size in the areas of the northern most wall of the basement, AW-3, and AW-8. Figure 7c also shows vapor contamination increasing in these areas. Overall, the HNU concentration data indicates that the vapor plume is becoming larger and is migrating away from the source area. The presence of this vapor plume indicates that fuel oil vapors will require continuous removal (in order to make the home habitable) unless its source (the free phase fuel oil) is removed completely.

In an attempt to control the migration of vapor and free phase product in the basement area, a new sump type pump has been installed in the recovery well. This type of pump will more effectively drawdown the ground water beneath the basement. We anticipate that the increased drawdown will reduce the migration of vapor and free phase fuel within and away from the basement area. The new pump was installed after the August 18, 1989 monitoring round. Ground water data continues to be collected. Unfortunately, this new data base is not significant enough to be analyzed yet. Therefore, no hard data is available with regard to the effectiveness of the new pump. The current pump setting will create a ground water depression approximately 6 to 8 inches deeper than the previous installation. This situation will be monitored closely and any changes related to the ground water system will be reported.

Indoor air quality sampling was performed by Aquatec Inc. on each of the three floors of the Silver residence in mid August 1989. Air samples were also taken from the basement and first floor of a neighboring home which uses fuel oil for heat. The air quality results from the unaffected neighboring home (i.e. clean background sample) will be used as a basis of comparison to compare with the Silver residence readings. When the results of the analyses are available, the VDOH will be consulted to assist in making the decision as to whether the Silver family should re-habitat the building.

In light of the facts gathered to date, the following conclusions are presented:

1. Significant amounts of fuel oil leaked from the copper delivery line connecting the 275 gallon storage tank to the oil fired furnace in the basement.

2. The release of fuel oil coupled with the spring rise in ground water caused free phase fuel oil to move upward and enter the basement of the residence, causing significant vapor contamination. The lower parts of the walls and chimney, and all the carpeting in the basement area were contaminated with free phase product.

3. Significant amounts of fuel oil vapor and free phase fuel oil exists beneath the majority of the basement floor. The fuel oil appears to be confined to beneath the basement floor by the presence of the concrete footers and native clay soils.

4. The ground water depression product/recovery system currently operating is containing the free phase product within the basement area.

5. More effective ground water depression must be achieved to effectively contain the vapor and free phase contamination along the north wall of the residence. This should be accomplished by operating a new sump pump type depression system in this area.

6. HNU readings indicate a significant decrease in fuel oil vapors within the basement and living areas of the residence since the new ground water depression system (by the chimney) was activated.

7. The furnishings in the living area of the residence may be releasing fuel oil vapors which were adsorbed before the polyethylene containment was installed. This hypothesis will be confirmed or disproved by the results of air quality sampling.

8. Fuel oil vapors contain several compounds which when inhaled for extended time periods can cause a threat to human health.

9. Significant vapor concentrations will continue to exist in the basement area until such time as all of the vapor and free phase fuel oil is removed from beneath the basement floor.

In light of the conclusions detailed above, it becomes obvious that the reduction of fuel oil vapors within the residence is of the utmost importance. At this time, the majority of vapors are entering the basement through the cement floor and walls. Contrary to most peoples belief, cement is porous and allows vapors to flow through it. Therefore, an active effort to reduce the concentration of vapors entering the building must be made. With this objective in mind, the following remedial schemes are presented as potential solutions. Each of these schemes will involve removal of the paneling, false walls, and stored materials in the basement.

Scheme 1: Install a new vented cement floor over the existing floor. This method of reducing the vapor concentrations would involve:

a. the filling and sealing of any cracks existing in the present floor (i.e. flow enhancement trench, settling and frost cracks),

b. the installation of a series of perforated pipes which would rest on the present floor, be manifolded together, and be connected to a special vacuum pump which would outlet to the atmosphere,

c. the installation of 6 to 8 inches of gravel on top of the piping system and the present floor,

d. the placement of a polyethylene vapor barrier on top of the gravel,

e. the construction of a new cement floor,

f. the operation of the vacuum pump to actively extract vapors (which would be removed utilizing activated carbon filtration methods) as they enter the gravel subfloor,

g. the cleaning of the walls and chimney with a biodegradable organic surfactant to remove any adsorbed fuel oil,

h. the continued operation of the current ground water depression/product recovery system, and

i. the performance of quarterly sampling of the indoor air in the Silver residence to ensure proper levels of air quality.

This method of vapor containment/extraction will intercept vapors before they enter the residence. However, since the source of the vapors (i.e. the contaminated ground water and soil beneath the floor) has not been removed, operation and maintenance of the system may range between one and ten years.

Scheme 2: Manual excavation of the contaminated soils beneath the basement floor.

This method of remediation would involve:

a. the complete polyethylene containment of the basement area,

b. the removal of all furniture, curtains, and rugs from the upper two floors of the residence,

c. the removal of the present cement floor,

d. the excavation and disposal of the contaminated soil from beneath the floor,

e. the excavation and disposal of sufficient amounts of native clay so that the entire clay surface below the residence slopes towards the recovery well,

f. the cleaning of the cement walls and footings with a biodegradable organic surfactant,

g. the placement of gravel to level the surface for the new floor,

h. the installation of manifolded vapor extraction pipes,

i. the placement of a polyethylene vapor barrier on top of the gravel and vapor extraction system,

j. the construction of a new cement floor,

k. the active extraction and treatment of any remnant fuel oil vapors,

l. the active pumping (and potential treatment) of ground water from beneath the floor, and

m. the quarterly air quality sampling within the residence for one year.

This scheme requires manual demolition and excavation of the existing floor and contaminated soils. The new floor and gravel must also be installed manually. During the excavation the upper portion of the residence would be emptied to avoid any adsorption of vapors which may penetrate the polyethylene containment. The laborers performing the excavation may need to be provided with individual clean air supplies while working due to the high vapor concentrations created during the excavation. The excavation of the present floor and construction of a new floor may take up to 6 to 8 weeks to perform due to the unusual working conditions.

This remediation scheme removes the source of the vapors entirely so the potential for active vapor recovery to occur for an extended period of time is minimal. Ground water may need to be pumped and potentially treated for a short time to ensure that lingering contamination effects are removed. After this, pumping (with no treatment) will only be needed to control basement flooding conditions.

Scheme 3: Replacement of the entire foundation.

This method of remediation involves:

a. removing or lifting the wooden structure of the residence from the current foundation,

b. the demolition and removal of the current foundation,

c. the excavation of the contaminated soil associated with the area,

d. the excavation of sufficient amounts of native clay to slope the entire surface beneath the basement toward a sump area for a recovery well to be installed outside the foundation,

e. the installation of gravel and a vapor extraction system under the site for the new foundation,

f. the reconstruction of the foundation utilizing seal coating and construction techniques that will effectively seal the foundation from infiltration of water and lingering fuel oil vapors,

g. the replacement of the wooden structure on the new foundation,

h. the monitoring of the recovery well and vapor extraction systems to establish the need for active recovery efforts, and

i. the collection of two indoor air samples six months apart, to ensure proper indoor air quality.

This method of remediation will require complicated construction techniques. However, the source of the contamination will be removed and the new basement will not require an active indoor sump. The potential of needing to operate either the vapor extraction or the ground water depression/recovery systems is extremely low. The number of air quality samples necessary to confirm the habitability of the residence is also minimal.

After you and your insurance company have reviewed this letter report we should all get together to discuss the schemes described above in more detail. If you have any questions or concerns in regard to the above matter, please do not hesitate to give me a call at 453-4384.

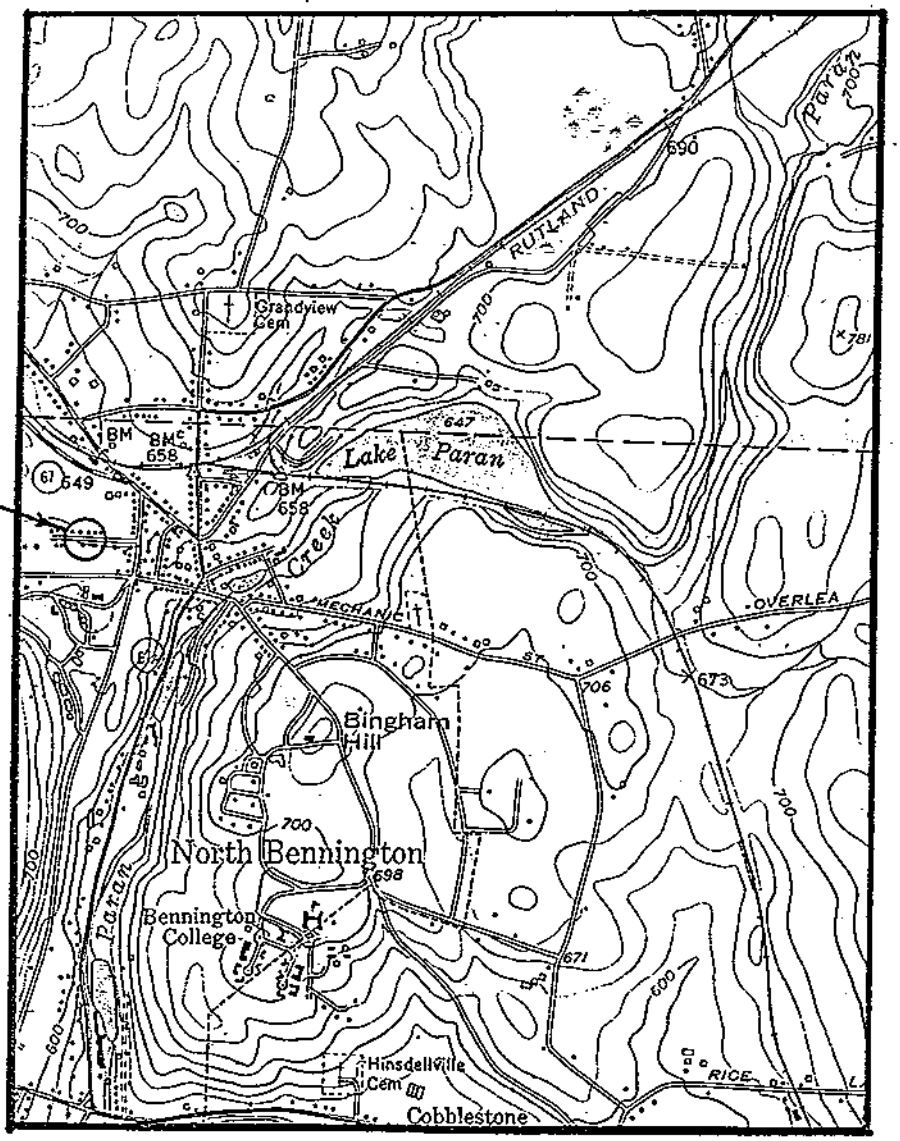
Sincerely,

Steven J. LaRosa
Hydrogeologist
Reviewed by:

Stephen Revell
Senior Hydrogeologist

SL: dwa
enclosures
cc: Mr. Chuck Schwer
Mr. Michael Fullerton (Granite Mutual Ins. Co.)
Mr. David Putter

GENERAL SITE LOCATION MAP



Scale: 1=24,000

Source: U.S.G.S. 15' Quadrangle Series
Bennington Quad.

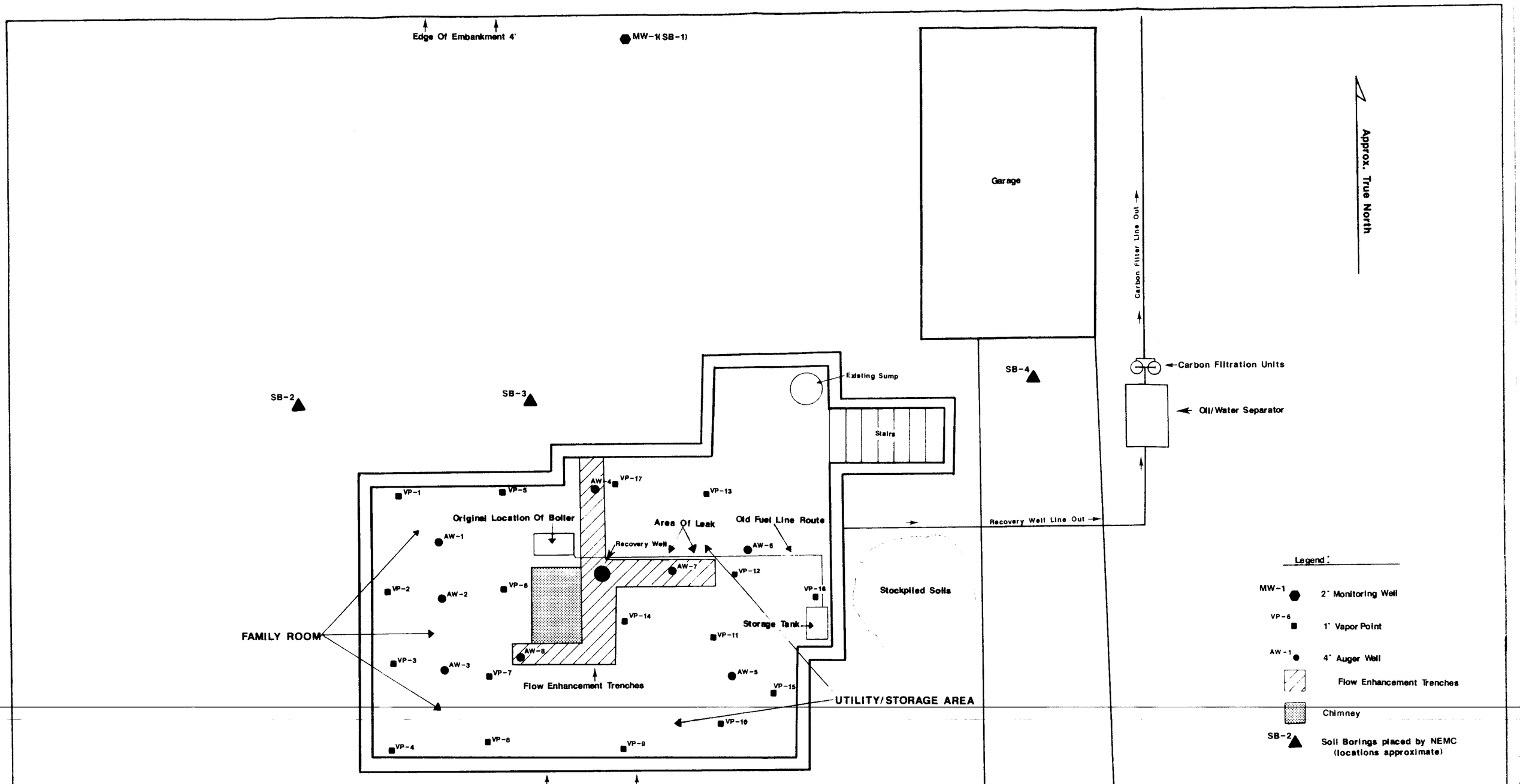


Figure 2

Silver s Residence - North Bennington	
Scale: 1" = 5'	Date: 7/89
DETAILED SITE LOCATION MAP	
Drawn By: PDT	Problem: Fuel Oil Contamination

ATTACHMENT A

NEW ENGLAND
MARINE CONTRACTORS, INC.
13 Dorset Lane
Williston, Vermont 05495
Telephone: 802-879-8800
Facsimile: 802-879-1273

NEMC

June 5, 1989

George C. Grant Adjusting Agency
P.O. Box 292
Rutland, VT 05701

Re: Silver Residence, N. Bennington, VT.

Dear Mr. Miller,

As per your request, New England Marine Contractors conducted exploratory drilling at the residence of Mike Silver, in North Bennington, on May 19, 1989, in order to determine if heating oil from a leaking line in Mr. Silver's basement has migrated beyond the foundation of the house. NEMC drilled a total of four borings on that date, using a hollow stem auger drill rig with 4-1/4" I.D. augers. A monitoring well was installed in the well which is directly down gradient of the leaky line, (see SB-1 on the enclosed site map).

Drilling was performed under the supervision of the NEMC project geologist. The geologist inspected soils retrieved from the augers for obvious petroleum contamination. Soils were screened for petroleum vapors using a portable photionozation device. Soil characteristics and well construction details are included on the enclosed well logs.

The four soil borings were placed as such so that we could determine if the lost petroleum had followed the water table in the down gradient direction, which in this case is assumed to be between northeast and northwest. This assumption is based on the overlying topography, which dips to the north.

The first soil boring was extended to a depth of fourteen feet. At this depth, which is at least six feet below the water table in the basement sump, we encountered moist clay. We assumed that the clay would yield some water at that depth, so we placed a monitoring well in that borehole. After several hours, that well filled with approximately one foot of water. Both the soils and the water in this borehole appeared to be free of petroleum contamination. The monitoring well can be used in the future to determine if the existing petroleum contamination in the basement is migrating down gradient.

The remaining three borings were all drilled to a depth of ten feet, which is two to three feet below the local water table. Soils retrieved from each boring consisted of mostly moist, brown clay. No evidence of petroleum contamination was discovered in these borings. The soil borings were completed using the drill cuttings as backfill. Well screens and casings were not installed in these borings.

From the evidence gathered from the four soil borings, it appears that the petroleum, which leaked from a line beneath Mike Silver's basement floor, has not migrated beyond the immediate vicinity of the foundation. What appears to have happened is that the petroleum is trapped in the gravel backfill which surrounds the foundation. The clay, which completely surrounds the foundation backfill, is acting as an aquitard, which prevents the rapid migration of groundwater, and any accompanying contamination. Furthermore, we conclude that the groundwater treatment system which is in place in the basement sump is the most effective means of remediating the remaining contamination.

If you have any questions regarding this assessment, please call me at (802) 879-8800. Thank you for using New England Marine Contractors.

Sincerely,

Peter M. Murray
Project Geologist

PMM/lld
Enclosure

cc: Mike Silver

PROJECT GRANT ADJUSTING AGENCY

LOCATION MIKE SILVER, NORTH BENNINGTON, VT

DATE DRILLED 5/19/89 TOTAL DEPTH OF HOLE 14'

DIAMETER 6"

SCREEN DIA. 2" LENGTH 10' SLOT SIZE .020"

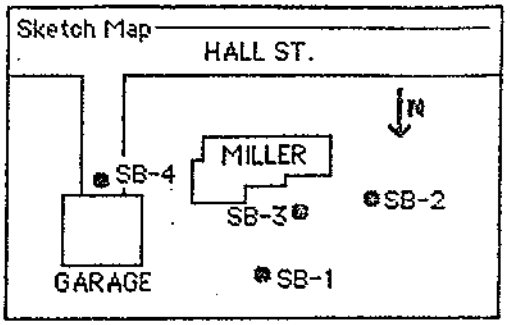
CASING DIA. 2" LENGTH 4' TYPE PVC

DRILLING CO. NEMC DRILLING METHOD HOLLOW STEM AUGER

DRILLER TOM THORNTON LOG BY P. MURRAY

WELL NUMBER SB-1

Sketch Map



DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0–3		CAP; NATIVE BACKFILL; BENTONITE		Moist, brown, sandy CLAY, some medium gravel NO PETROLEUM ODOR
4–14		GRAVEL PACK; WELL SCREEN		Light brown, moist CLAY, little sand and gravel NO PETROLEUM ODOR BASE OF EXPLORATION AT 14'

New England Marine Contractors

PROJECT GRANT ADJUSTING AGENCY

LOCATION MIKE SILVER, NORTH BENNINGTON, VT

DATE DRILLED 5/19/89 TOTAL DEPTH OF HOLE 10'

DIAMETER 6"

SCREEN DIA. _____ LENGTH _____ SLOT SIZE _____

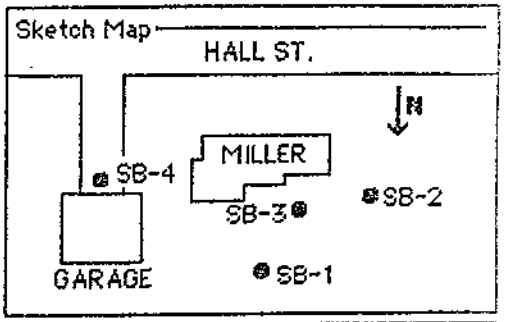
CASING DIA. _____ LENGTH _____ TYPE _____

DRILLING CO. NEMC DRILLING METHOD HOLLOW STEM AUGER

DRILLER TOM THORNTON LOG BY P. MURRAY

WELL NUMBER SB-2

Sketch Map



DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0				Coarse, GRAVEL fill NO PETROLEUM ODOR
3				Moist, brown CLAY, little medium to coarse gravel NO PETROLEUM ODOR
6				Wet, light brown CLAY NO PETROLEUM ODOR
9				BASE OF EXPLORATION AT 10'
10				
11				
12				
13				
14				
15				
16				

New England Marine Contractors

PROJECT GRANT ADJUSTMENT AGENCY

LOCATION MIKE SILVER, NORTH BENNINGTON, VT

DATE DRILLED 5/19/89 TOTAL DEPTH OF HOLE 10'

DIAMETER 6"

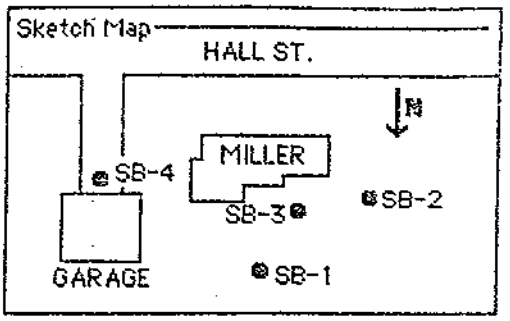
SCREEN DIA. _____ LENGTH _____ SLOT SIZE _____

CASING DIA. _____ LENGTH _____ TYPE _____

DRILLING CO. NEMC DRILLING METHOD HOLLOW STEM AUGER

DRILLER TOM THORNTON LOG BY P. MURRAY

WELL NUMBER SB-3



DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0–5				Brown CLAY, little sand and medium to coarse gravel NO PETROLEUM ODOR
6–10				Wet, brown CLAY NO PETROLEUM ODOR BASE OF EXPLORATION AT 10'

New England Marine Contractors

PROJECT GRANT ADJUSTING AGENCY

LOCATION MIKE SILVER, NORTH BENNINGTON, VT

DATE DRILLED 5/19/89 TOTAL DEPTH OF HOLE 10'

DIAMETER 6"

SCREEN DIA. _____ LENGTH _____ SLOT SIZE _____

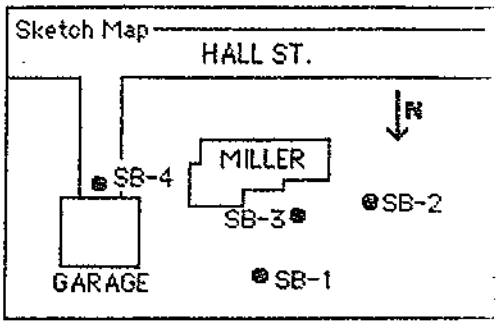
CASING DIA. _____ LENGTH _____ TYPE _____

DRILLING CO. NEMC DRILLING METHOD HOLLOW STEM AUGER

DRILLER TOM THORNTON LOG BY P. MURRAY

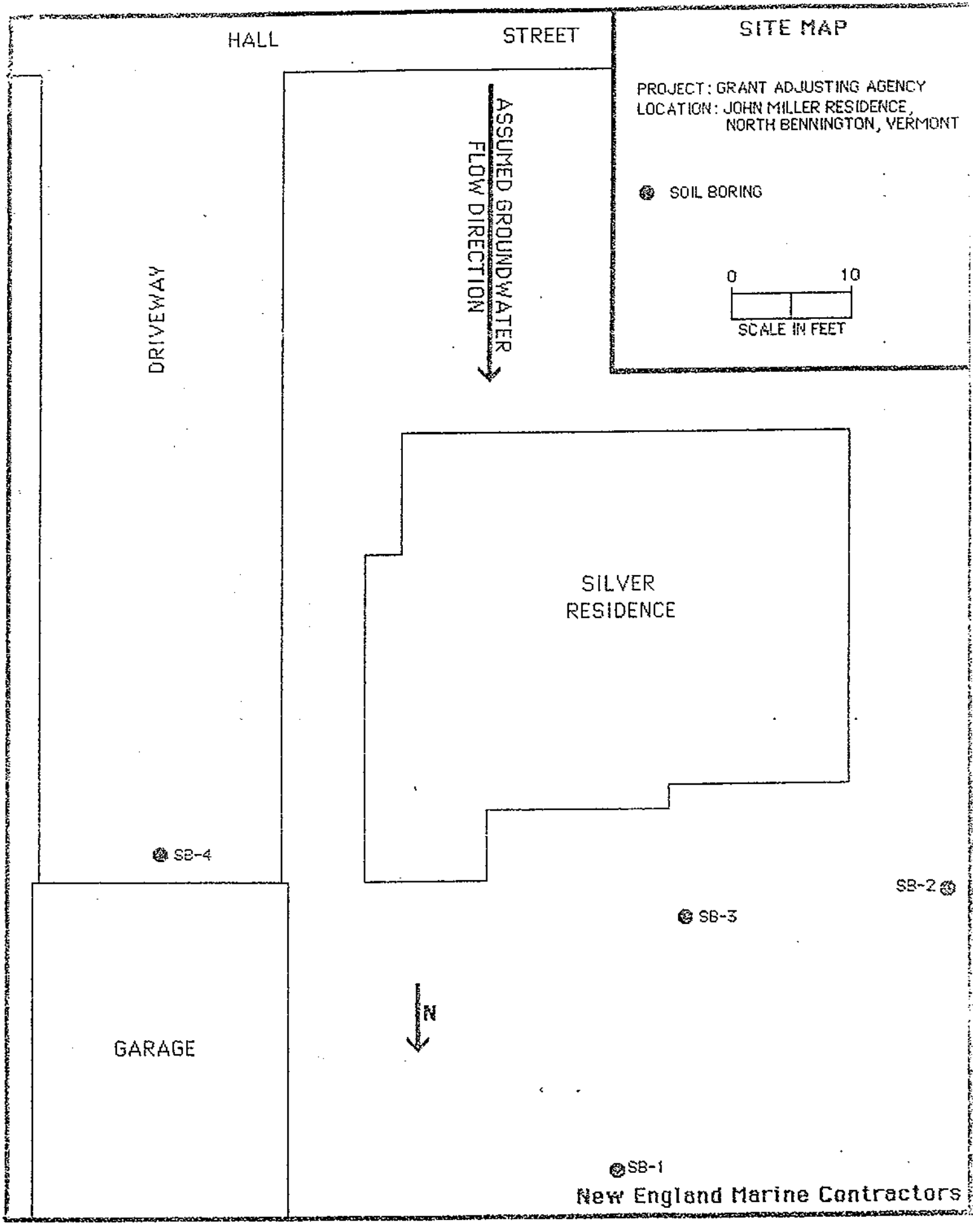
WELL NUMBER SB-4

Sketch Map



DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0				ASPHALT
1				SAND and GRAVEL fill
2				Brown CLAY, little sand and gravel
3				
4				NO PETROLEUM ODOR
5				
6				Wet, brown CLAY
7				
8				NO PETROLEUM ODOR
9				
10				BASE OF EXPLORATION AT 10'
11				
12				
13				
14				
15				
16				

New England Marine Contractors


HALL
STREET
SITE MAP
PROJECT: GRANT ADJUSTING AGENCY
LOCATION: JOHN MILLER RESIDENCE,
NORTH BENNINGTON, VERMONT
SOIL BORING
0
10
SCALE IN FEET
ASSUMED GROUNDWATER
FLOW DIRECTION
DRIVEWAY
SILVER
RESIDENCE
SB-4
SB-2
SB-3
N
GARAGE
SB-1
New England Marine Contractors

PROJECT Silver Residence JOB NO. #8924

LOCATION N. Bennington, VT. SHEET 1 OF 1

LINCOLN APPLIED GEOLOGY, INC.

DATA POINT	REFERENCE ELEVATION	GROUND WATER ELEVATIONS/PRODUCT THICKNESS									
		DATE	7/11/89	7/14/89	7/21/89	7/28/89	8/4/89	8/11/89	8/18/89		
MW-1	655.59		648.05	647.53	647.05	646.65	646.68	647.39	647.71		
AW-1	650.20		649.15	649.11	648.88	648.82	648.91	649.22	649.31		
AW-2	650.24		649.16	649.13	648.86	648.85	648.95	649.22	649.31		
AW-3	650.30		649.14	649.21	648.90	648.85	648.93	649.19	649.28		
AW-4	650.59		648.86	.03 648.87	.01 648.88	.01 648.85	648.88	648.93	648.95		
AW-5	650.40		648.84	649.18	649.05	649.04	649.06	649.27	649.32		
AW-6	650.17		649.21	649.09	648.93	.02 648.83	648.88	649.24	649.30		
AW-7	650.40		648.75	.01 648.75	648.77	DRY	648.78	648.80	648.91		
AW-8	650.42		648.72	648.73	DRY	DRY	DRY	648.77	648.92		
RW-1	650.00		648.40	.05 648.28	-	.06 648.30	.03 648.33	648.41	648.51		

NOTES: 1) Elevation datum assumed.
2) "Reference Elevation" is elevation of top of PVC well casing at each data point.

Table 1

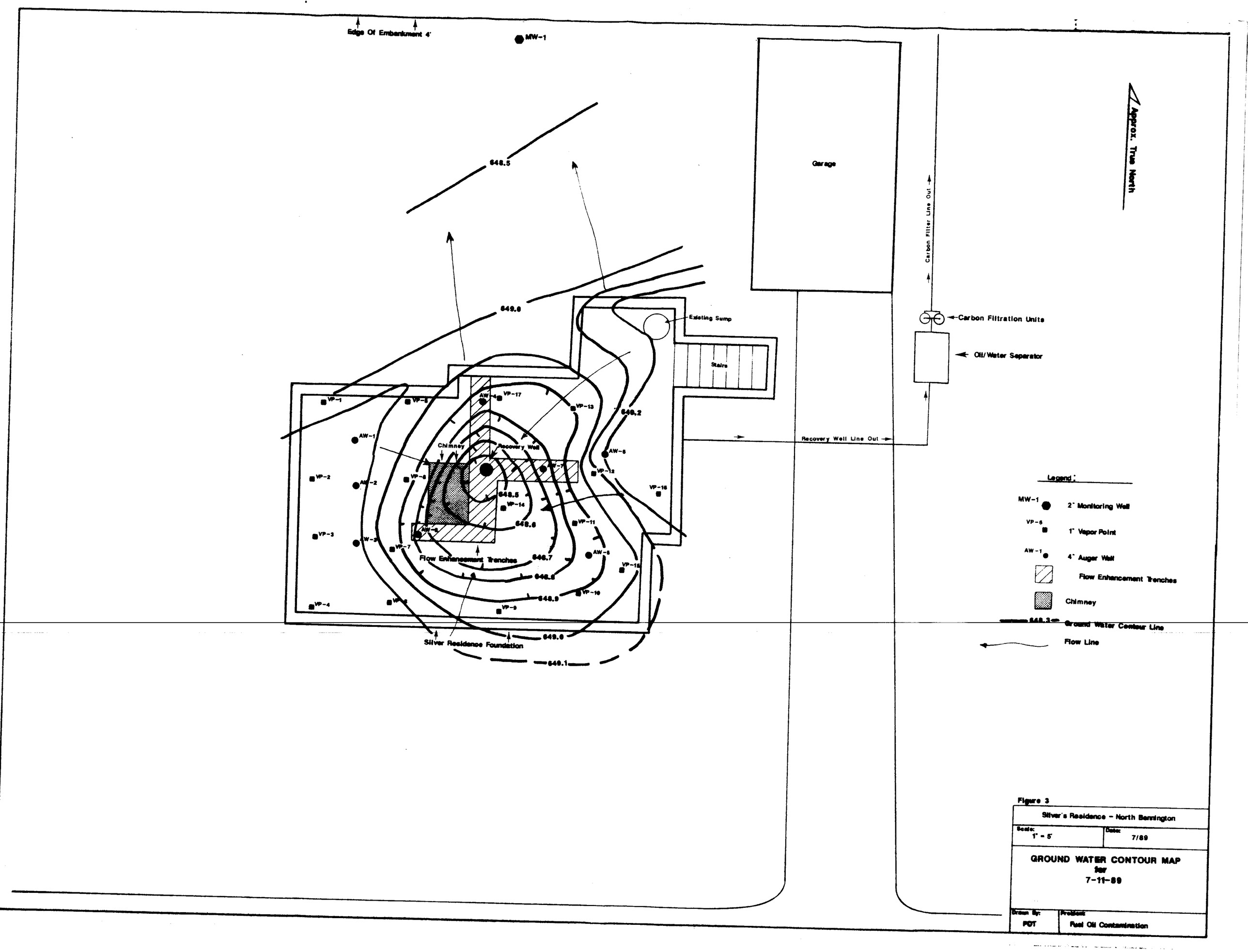


Figure 3

Silver's Residence - North Barrington	
Scale: 1" = 5'	Date: 7/89
GROUND WATER CONTOUR MAP for 7-11-89	
Drawn By: PDT	Problem: Fuel Oil Contamination

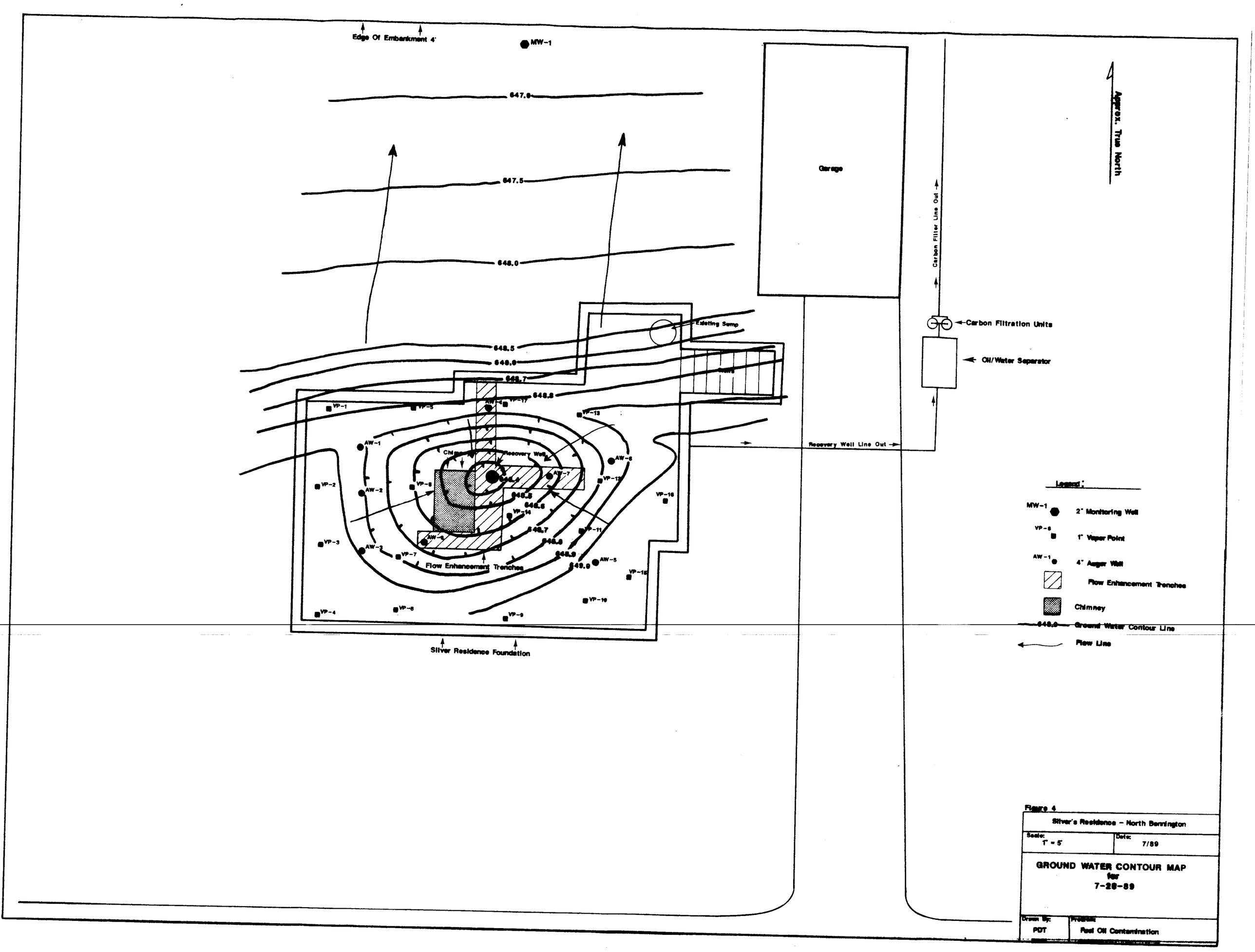


Figure 4

Silver's Residence – North Bennington	
Scale: 1" = 5'	Date: 7/89
GROUND WATER CONTOUR MAP for 7-28-89	
Drawn By: PDT	Project: Fuel Oil Contamination

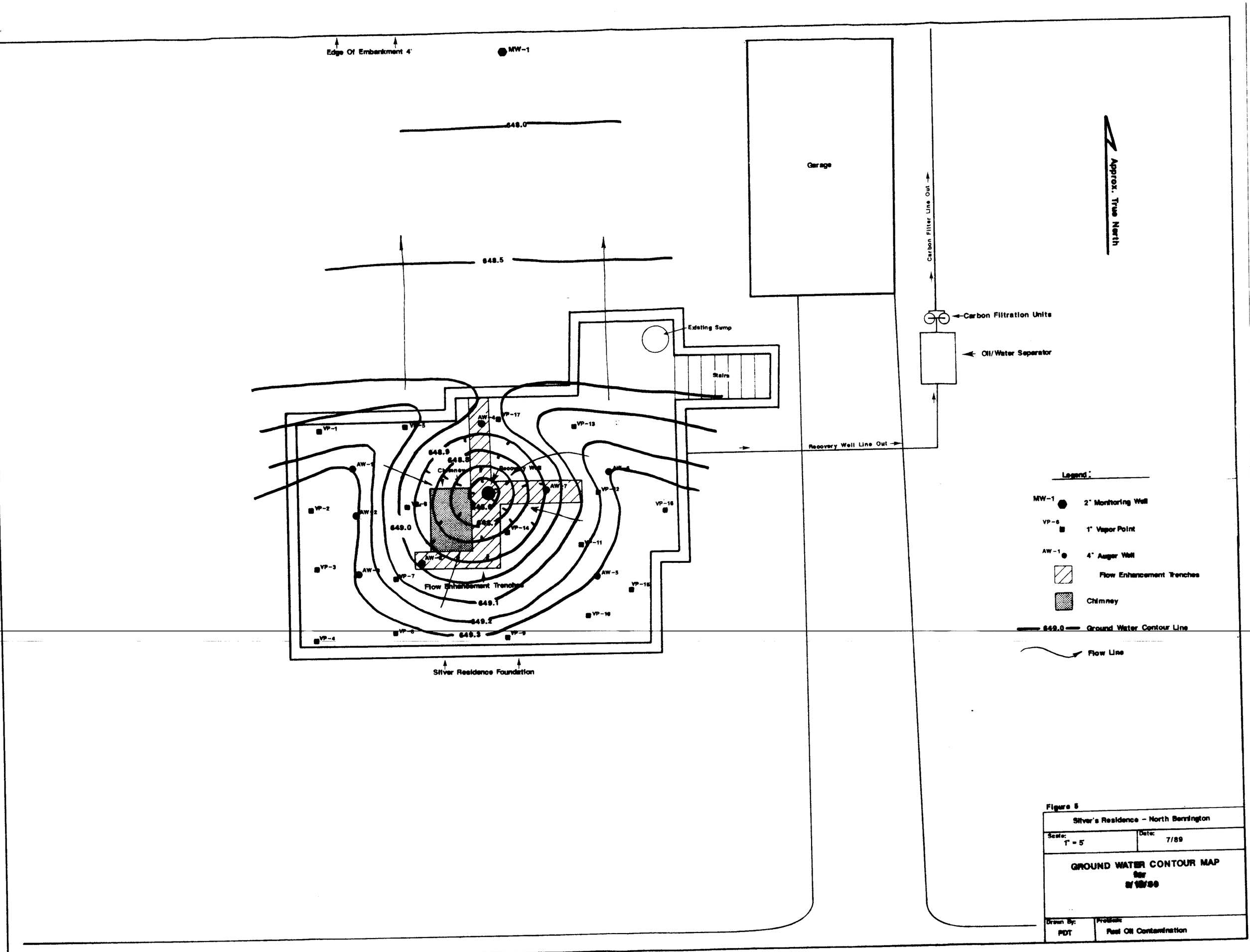


Figure 5

Silver's Residence - North Bennington	
Scale: 1" = 5'	Date: 7/89
GROUND WATER CONTOUR MAP for 8/10/89	
Drawn By: PDT	Problem: Fuel Oil Contamination

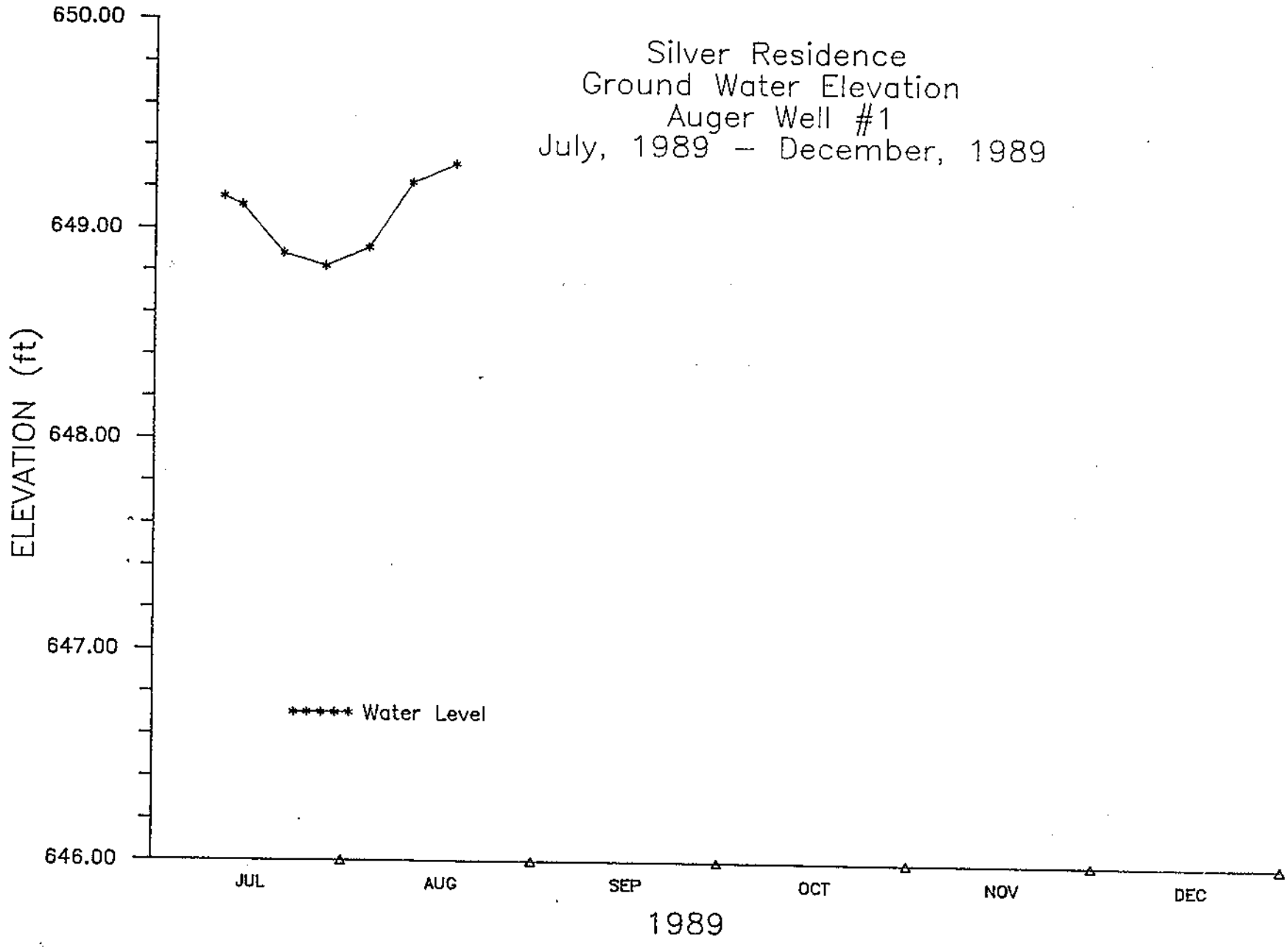

Silver Residence
Ground Water Elevation
Auger Well #1
July, 1989 – December, 1989
650.00
649.00
648.00
647.00
646.00
ELEVATION (ft)
***** Water Level
JUL
AUG
SEP
OCT
NOV
DEC
1989

Figure 6a

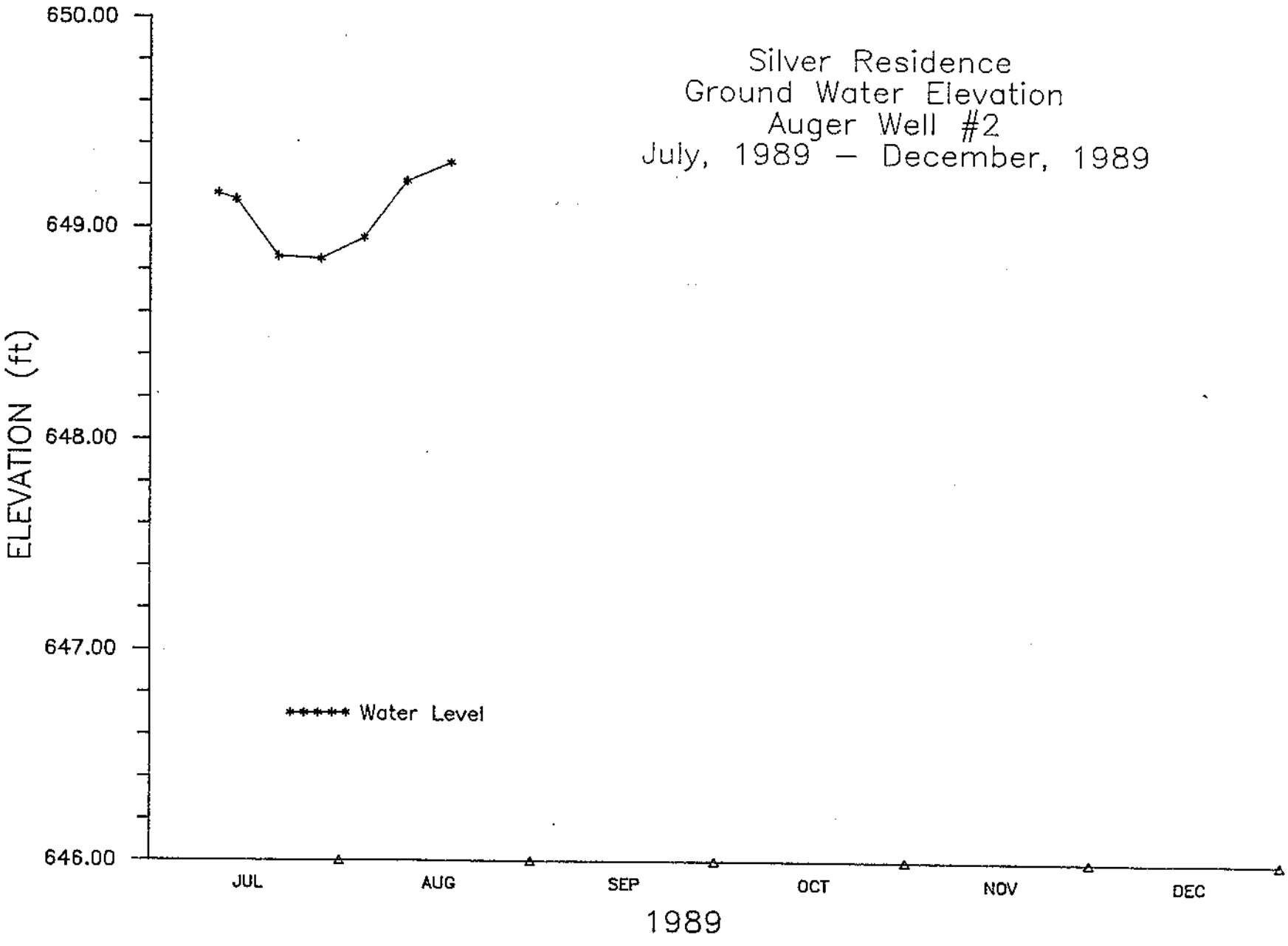

Silver Residence
Ground Water Elevation
Auger Well #2
July, 1989 – December, 1989
650.00
649.00
648.00
647.00
646.00
ELEVATION (ft)
***** Water Level
JUL
AUG
SEP
OCT
NOV
DEC
1989

Figure 6b

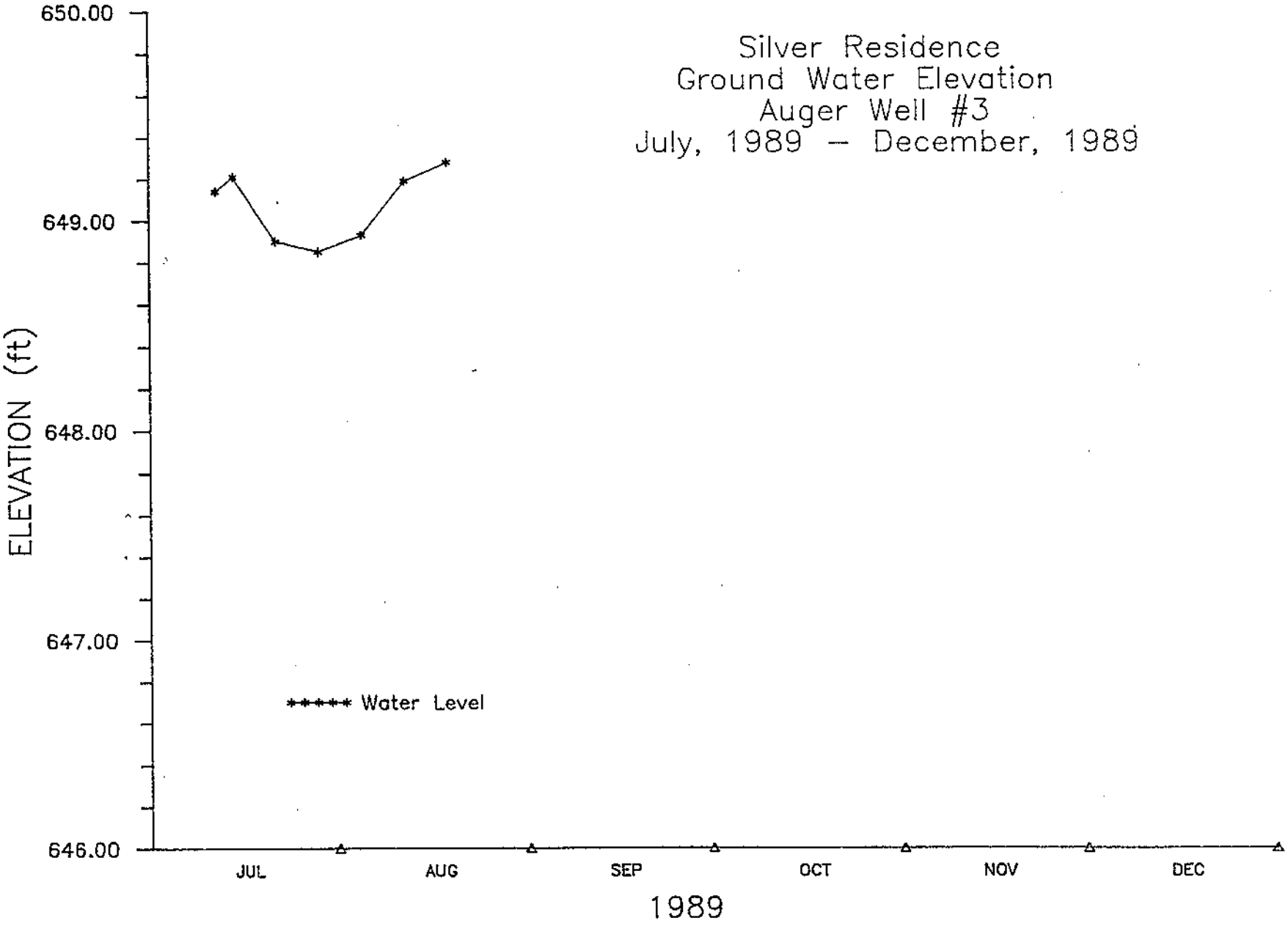

Silver Residence
Ground Water Elevation
Auger Well #3
July, 1989 – December, 1989
650.00
649.00
648.00
647.00
646.00
ELEVATION (ft)
***** Water Level
JUL
AUG
SEP
OCT
NOV
DEC
1989

Figure 6c

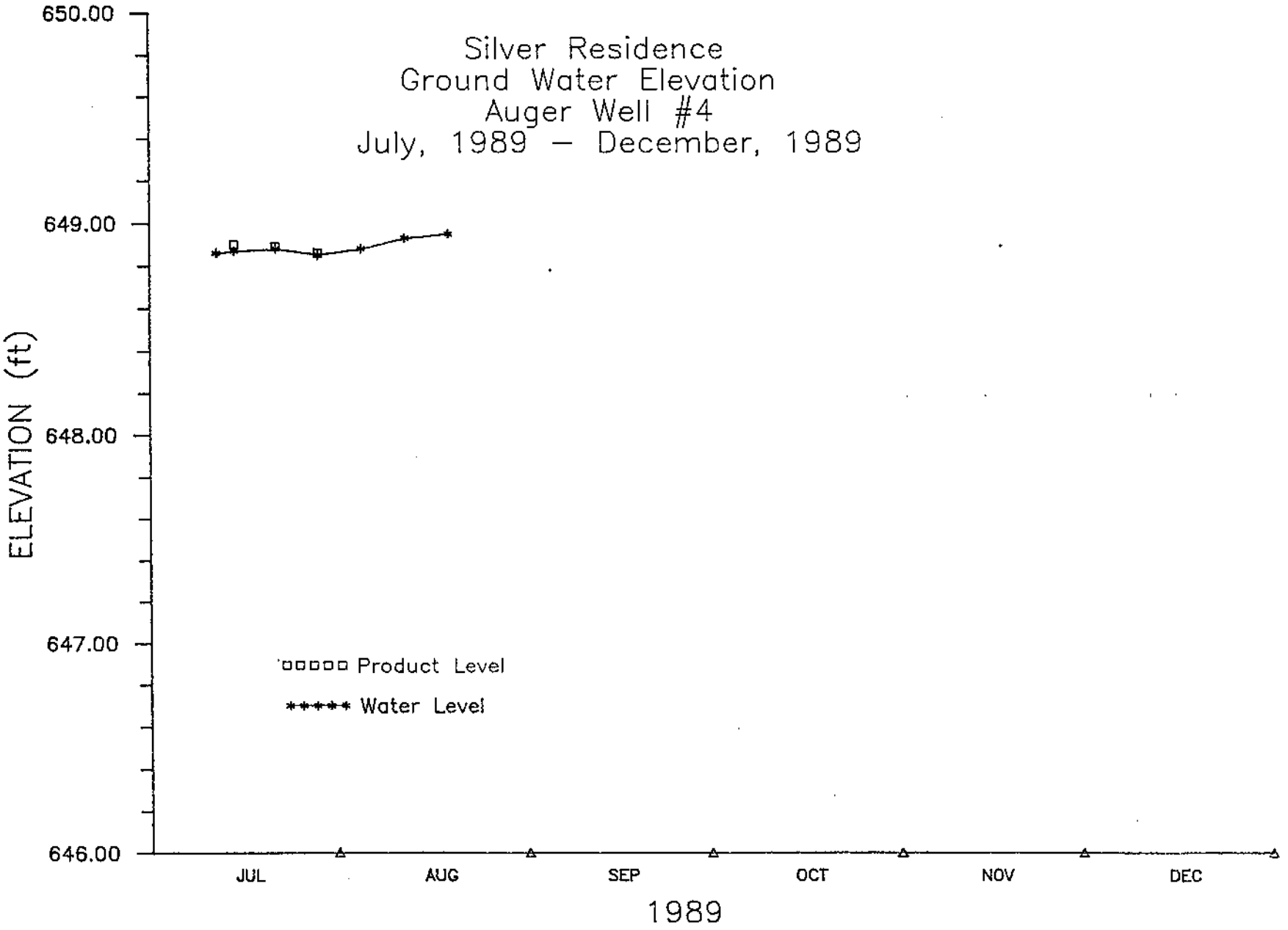

Silver Residence
Ground Water Elevation
Auger Well #4
July, 1989 – December, 1989
650.00
649.00
648.00
647.00
646.00
ELEVATION (ft)
Product Level
Water Level
JUL
AUG
SEP
OCT
NOV
DEC
1989

Figure 6d

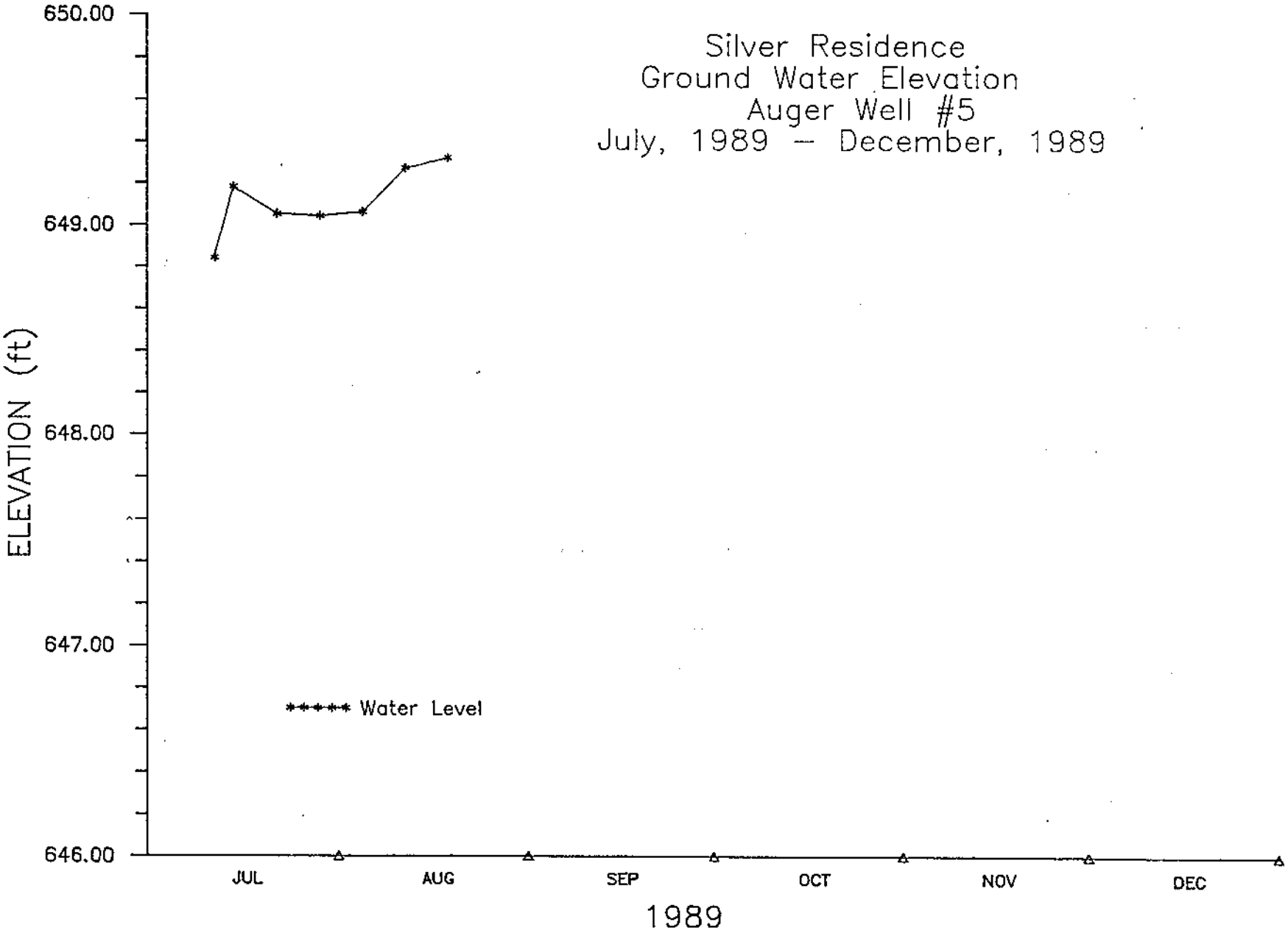

Silver Residence
Ground Water Elevation
Auger Well #5
July, 1989 – December, 1989
650.00
649.00
648.00
647.00
646.00
ELEVATION (ft)
***** Water Level
JUL
AUG
SEP
OCT
NOV
DEC
1989

Figure 6e

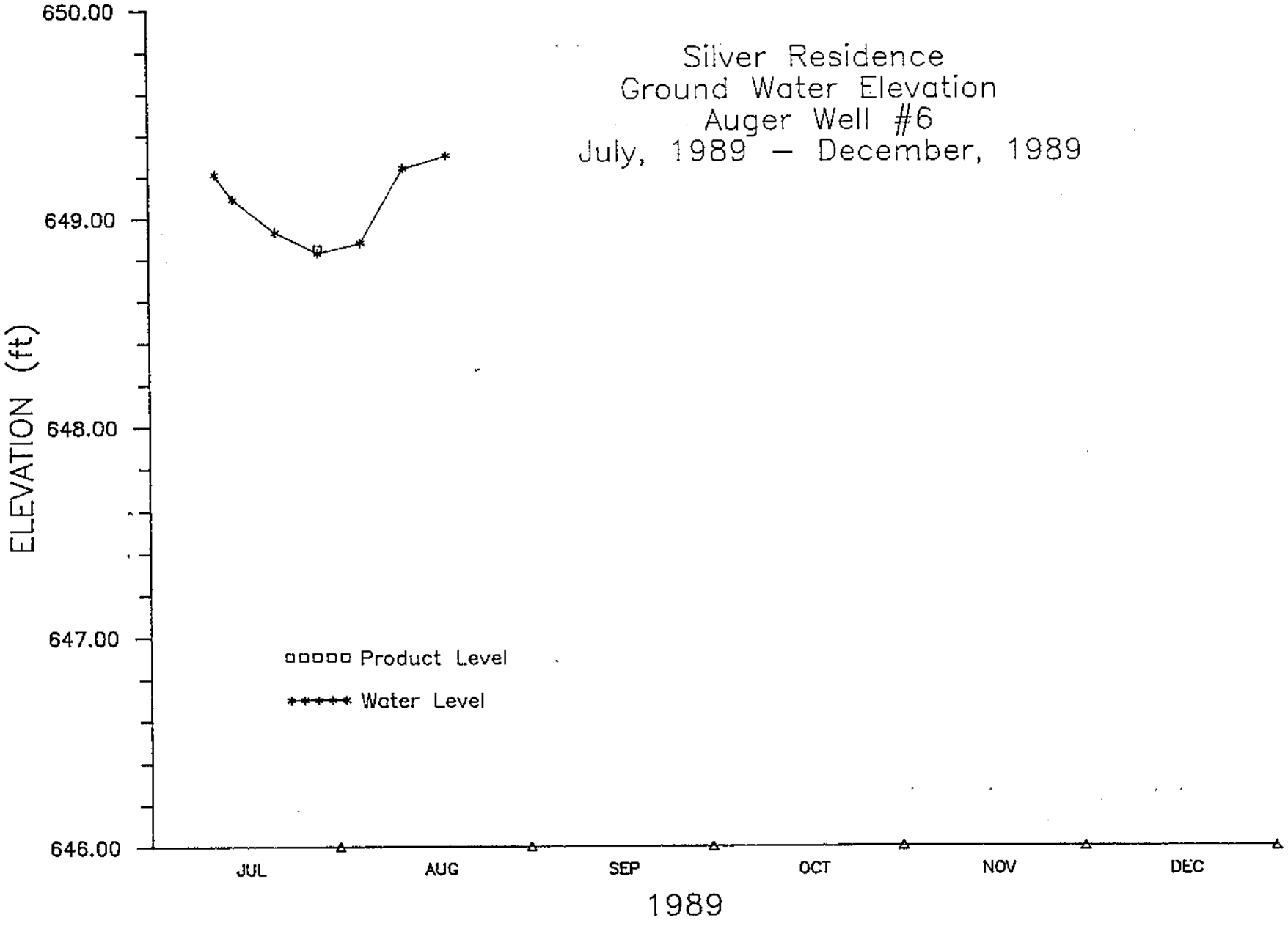

Silver Residence
Ground Water Elevation
Auger Well #6
July, 1989 – December, 1989
650.00
649.00
648.00
647.00
646.00
ELEVATION (ft)
Product Level
Water Level
JUL
AUG
SEP
OCT
NOV
DEC
1989

Figure 6f

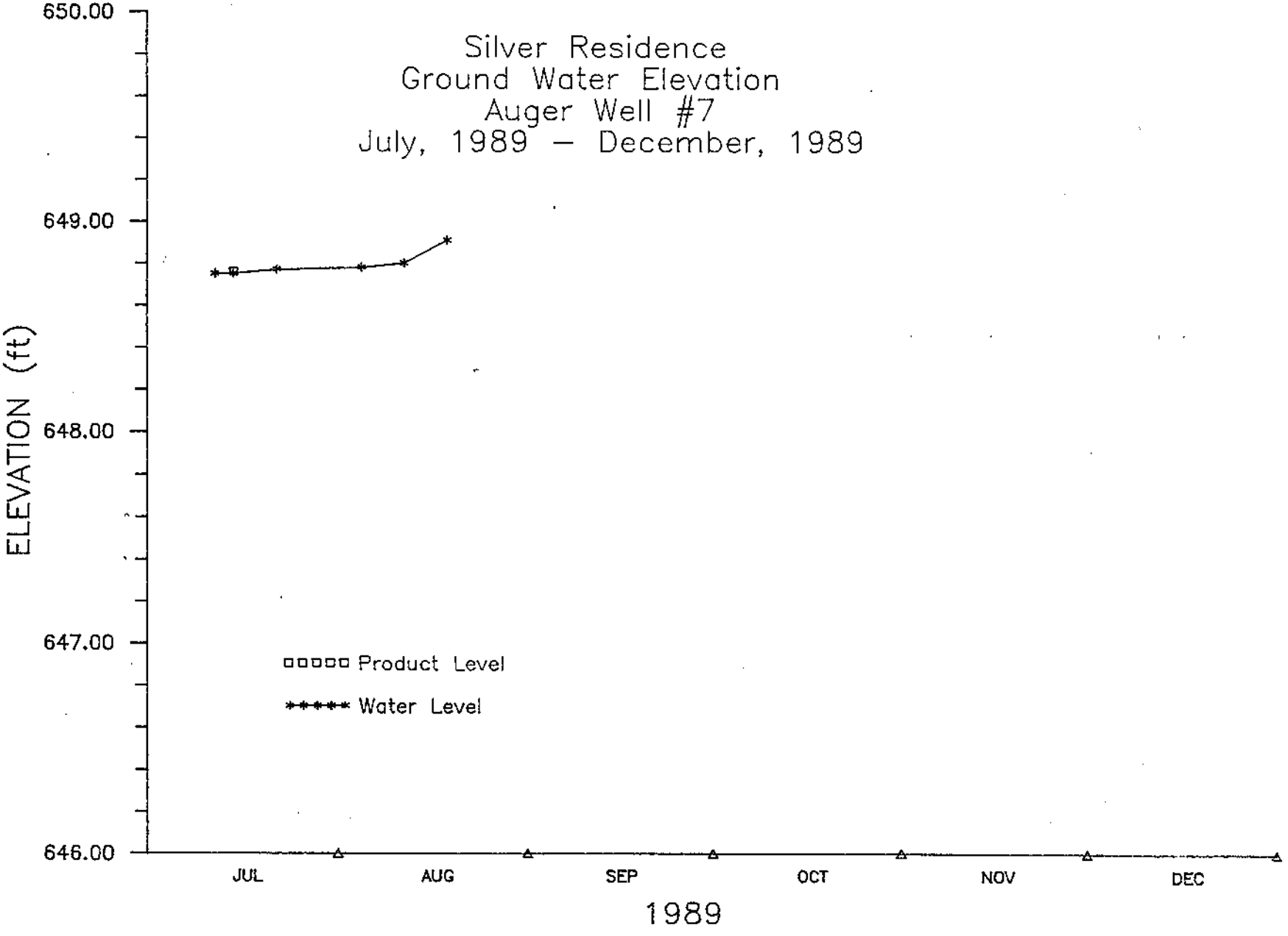

Silver Residence
Ground Water Elevation
Auger Well #7
July, 1989 – December, 1989
650.00
649.00
648.00
647.00
646.00
ELEVATION (ft)
Product Level
Water Level
JUL
AUG
SEP
OCT
NOV
DEC
1989

Figure 6g

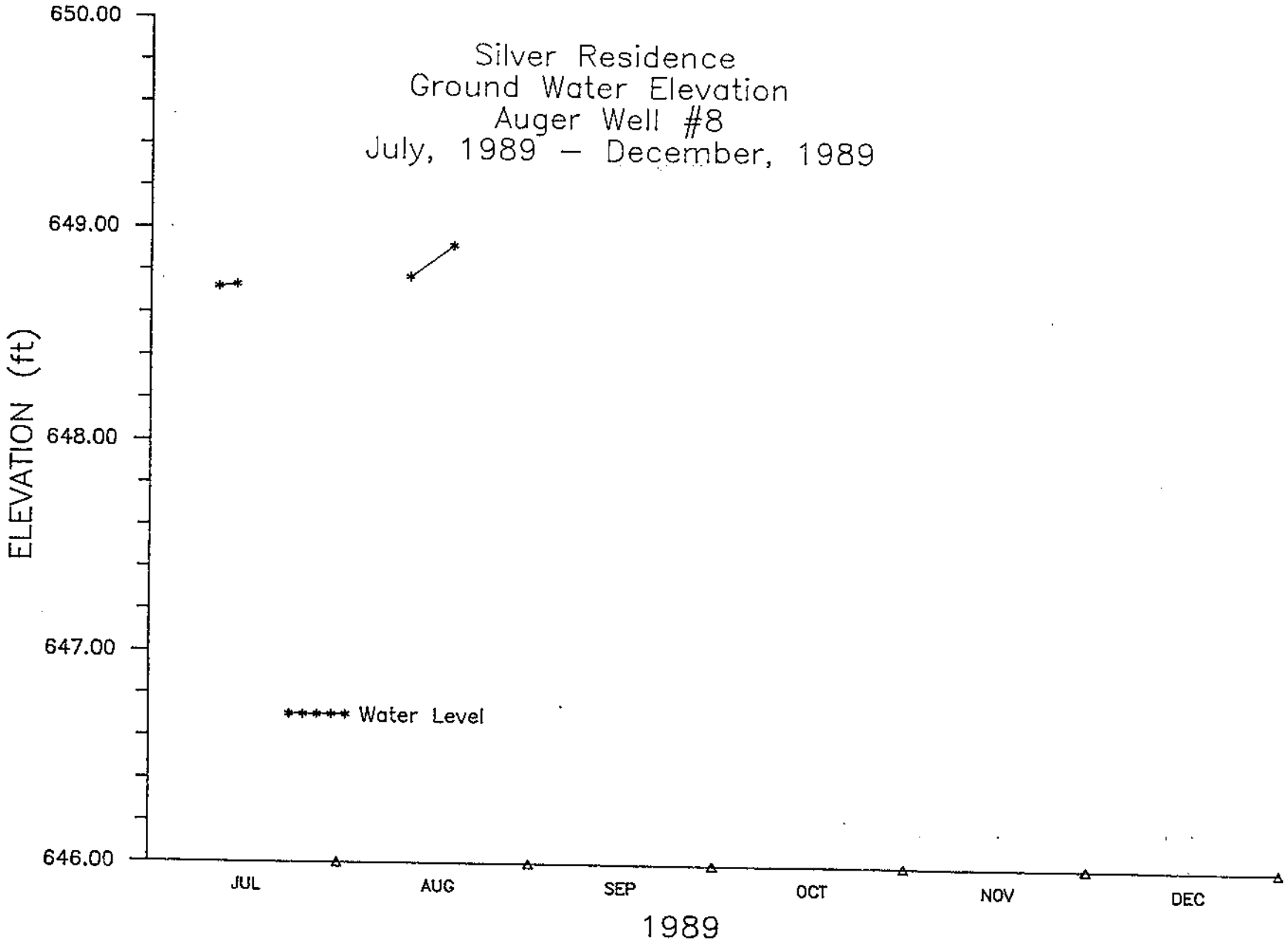

Silver Residence
Ground Water Elevation
Auger Well #8
July, 1989 – December, 1989
650.00
649.00
648.00
647.00
646.00
ELEVATION (ft)
Water Level
JUL
AUG
SEP
OCT
NOV
DEC
1989

Figure 6h

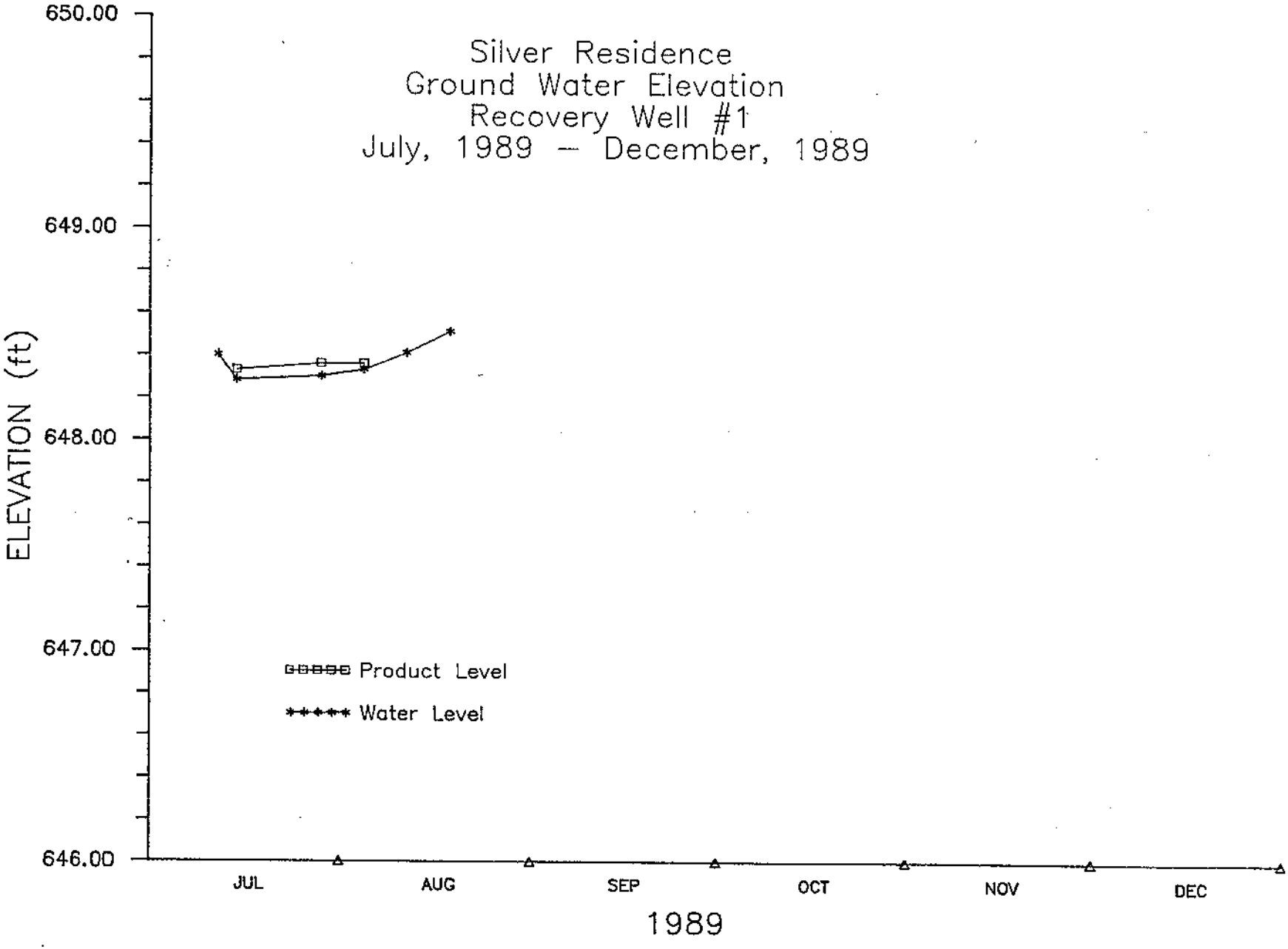

Silver Residence
Ground Water Elevation
Recovery Well #1
July, 1989 – December, 1989
650.00
649.00
648.00
647.00
646.00
ELEVATION (ft)
Product Level
Water Level
JUL
AUG
SEP
OCT
NOV
DEC
1989

Figure 6i

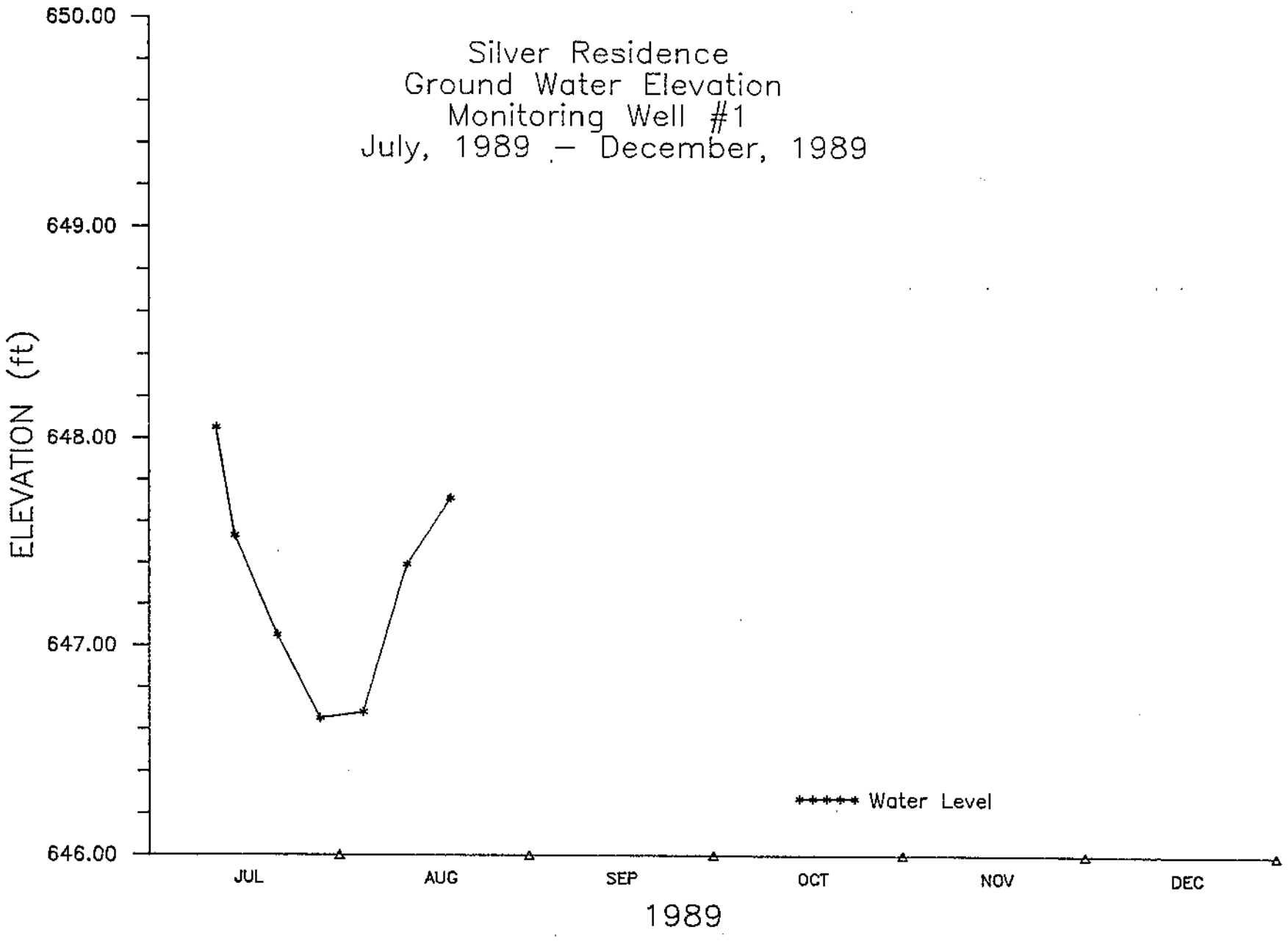

Silver Residence
Ground Water Elevation
Monitoring Well #1
July, 1989 – December, 1989
650.00
649.00
648.00
647.00
646.00
ELEVATION (ft)
JUL
AUG
SEP
OCT
NOV
DEC
1989
Water Level

Figure 6j

PROJECT Silver Residence JOB NO. 8924

LOCATION N. Bennington, VT. SHEET 1 OF 1

Table 2

LINCOLN APPLIED GEOLOGY

PHOTOIONIZATION DATA

WELL #	DATE	7/11/89	7/14/89	7/21/89	7/28/89	8/4/89	8/11/89	8/18/89		
MW-1		BG	BG	BG	BG	BG	.4	BG		
AW-1		45	22	3.0	36	32	3.0	3.0		
AW-2		50	30	34	48	32	8.4	2.4		
AW-3		1.0	1.0	BG	1.0	BG	BG	-		
AW-4		120	62	40	16.8	62	38	15.8		
AW-5		80	56	36	58	28	17	8.4		
AW-6		200	160	156	180	170	106	120		
AW-7		120	100	60	70	86	46	12.8		
AW-8		30	9	1.0	BG	8	BG	BG		
VP-1		1.5	1.8	1.0	1.4	BG	BG	BG		
VP-2		BG	BG	BG	BG	BG	BG	BG		
VP-3		BG	BG	BG	BG	BG	BG	BG		
VP-4		BG	BG	BG	BG	BG	BG	BG		
VP-5		15	60	50	84	108	110	110		
VP-6		40	15	65	70	88	20	13		
VP-7		20	50	60	94	100	32	70		
VP-8		BG	BG	1.0	BG	BG	BG	1.4		
VP-9		BG	BG	BG	BG	BG	BG	1.6		
VP-10		BG	BG	BG	BG	BG	BG	1.0		
VP-11		3.0	4.0	3.0	5.0	4.0	1.0	1.0		
VP-12		100	100	82	120	158	100	60		
VP-13		5	3	4.5	4.6	5.2	2.4	4.2		
VP-14		20	58	20	48	84	50	42		
VP-15		BG	2	BG	BG	BG	BG	BG		
VP-16		50	70	130	154	200	108	74		
VP-17		25	20	56	70	90	114	124		

Edge Of Embankment 4'

MW-1

Garage

Carbon Filter Line Out

Approx. True North

Existing Sump

Stairs

Carbon Filtration Units

Oil/Water Separator

Recovery Well Line Out

VP-1 VP-5 AW-4 VP-17 VP-13 AW-1 Chimney Recovery Well AW-6 AW-7 VP-12 VP-2 AW-2 VP-6 100 ppm VP-16 50ppm VP-14 20 ppm VP-11 AW-8 VP- AW-3 VP-7 Flow Enhancement Trenches AW-5 VP-15 0 ppm VP-10 VP-4 VP-8 VP-9

Silver Residence Foundation

Legend:

- MW-1 — 2" Monitoring Well
- VP-6 — 1" Vapor Point
- AW-1 — 4" Auger Well
- Flow Enhancement Trenches
- Chimney
- 150 ppm — Hnu Isopleth Line

Figure 7a

Silver's Residence – North Bennington	
Scale: 1" = 5'	Date: 7/89
HNU ISOPLETH MAP (ppm) for 7-11-89	
Drawn By: PDT	Problem: Fuel Oil Contamination

Edge Of Embankment 4'

MW-1

Approx. True North

Garage

Carbon Filter Line Out

Carbon Filtration Units

Oil/Water Separator

Existing Sump

Stairs

Recovery Well Line Out

100 ppm

50ppm

0 ppm

VP-1 VP-5 AW-4 VP-17 VP-13 AW-1 Chimney Recovery Well AW-6 VP-2 AW-2 VP-6 AW-7 VP-12 VP-16 VP-14 AW-8 VP-11 VP-3 AW-3 VP-7 Flow Enhancement Trenches AW-5 VP-15 VP-4 VP-8 VP-10 VP-9

Silver Residence Foundation

Legend:

MW-1 2" Monitoring Well

VP-6 1" Vapor Point

AW-1 4" Auger Well

Flow Enhancement Trenches

Chimney

20 ppm HNu Isopleth Line

Figure 7c

Silver's Residence - North Bennington	
Scale: 1" = 5'	Date: 7/89
HNU ISOPLETH MAP (ppm) for 8-16-89	
Drawn By: PDT	Problem: Fuel Oil Contamination

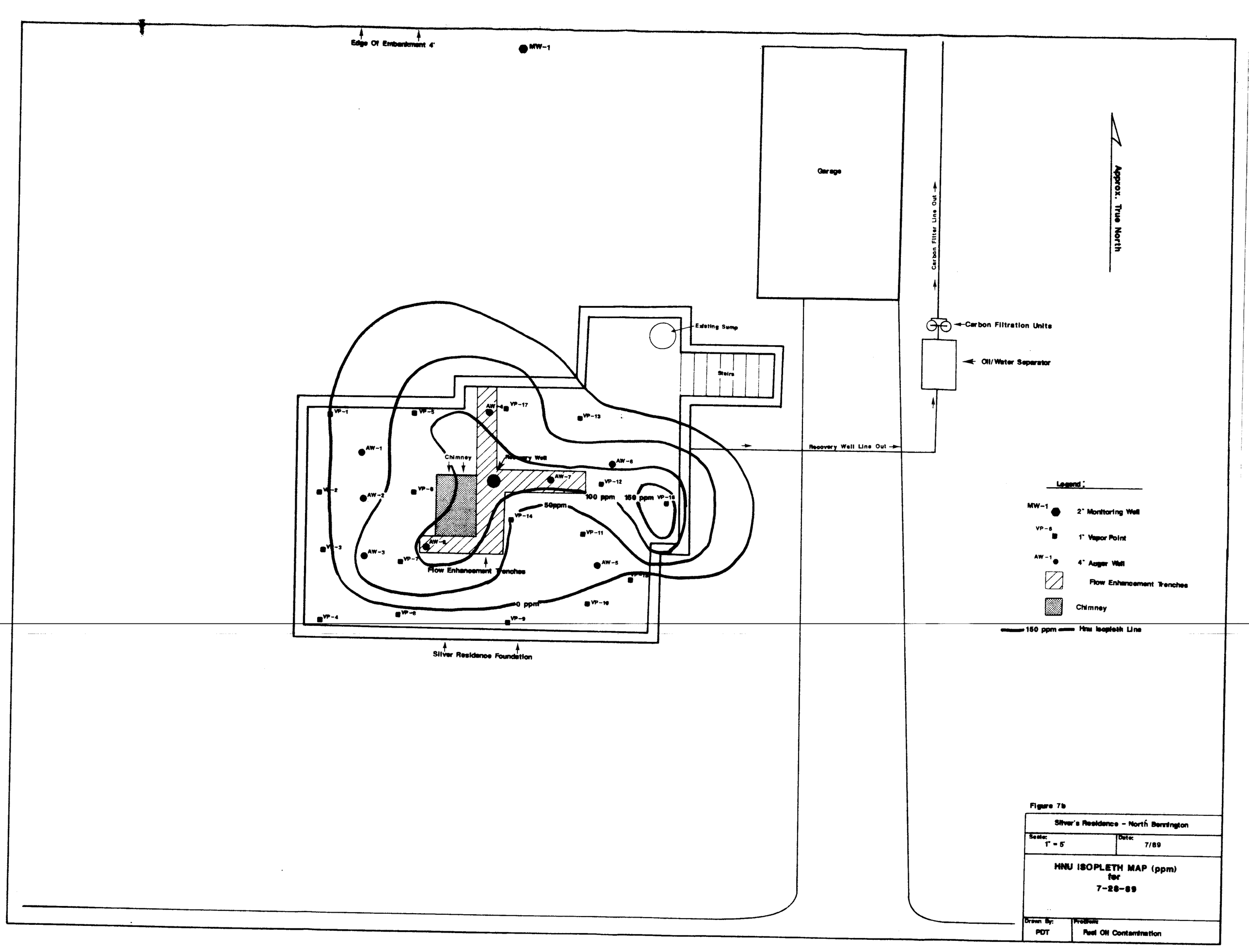


Figure 7b

Silver's Residence - North Bennington

Scale:	Date:
1" = 5'	7/89

HNU ISOPLETH MAP (ppm)
for
7-28-89

Drawn By:	Problem:
PDT	Fuel Oil Contamination